

Hispanic Youth Gets First Exposure to the Wonders of Materials

During the summer of 2004 high school students were introduced to Material Science and Engineering Topics by PREM faculty and collaborating professors. They attended an introductory orientation followed by demonstrations on a number of materials phenomena. Demonstration kits on superconductivity amazed the young minds by levitating Nd-Fe-B magnets using an LN₂-cooled YBCO superconductor. The “magic” of memory alloys was exhibited using Nitinol wires. Additional modules presented the atomic arrangement in solids, grain structures, optic fibers, LEDs, etc.

Twice during the summer, UPRM Pre-Engineering Program participants joined successful demonstration sessions similar to the one aforementioned. Posterior surveys evinced the major impression caused by those sessions on the young group. Then young female high school students taking part of the First Camp of Mechanical Engineering also benefited from these demonstrations. More than 82 students were involved in those activities (Figure 1).



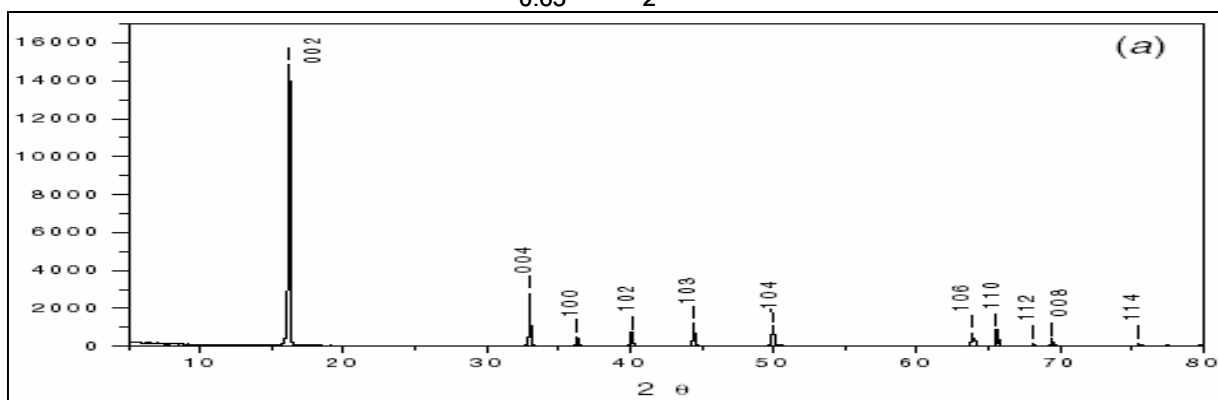
Figure 1: Montage of photographs taken during the summer of 2004 outreach activities on Materials Science. UPRM Dept. of General Engineering classroom and mint Materials Science and Engineering instructional laboratory were used for this purpose.

Some of those modules were developed and provided by the Interdisciplinary Education Group of the University of Wisconsin-Madison MRSEC. During these events, the assistance provided by student members of the recently formed Mayagüez ASM/TMS Joint Student Chapter was instrumental for the success of these events. This student chapter, the first in the island, was created under the umbrella of PREM.

Advanced Superconducting Material Synthesized via Sol-Gel Route

Since the discovery of superconductivity in $\text{Na}_{0.35}\text{CoO}_2 \cdot 1.3 \text{H}_2\text{O}$, it has attracted scientific efforts due to its unique structural and physical properties. The existence of superconductivity in water-intercalated $\text{Na}_{0.7}\text{CoO}_2$ has been a breakthrough in layered oxide superconductors. At UPRM (Dr. M. Tomar's nanomaterials laboratory) for the first time parent $\text{Na}_{0.7}\text{CoO}_2$ has been successfully synthesized by sol-gel route in powder and thin film forms. The x-ray diffraction of produced powders shows a highly crystalline and stoichiometric hexagonal phase, which is in good agreement with results by Y G Shi et al, as shown in Figure 2.

XRD for $\text{Na}_{0.65}\text{CoO}_2$. Y G Shi et al.



XRD sol-gel procedure at UPRM for $\text{Na}_{0.7}\text{CoO}_2$.

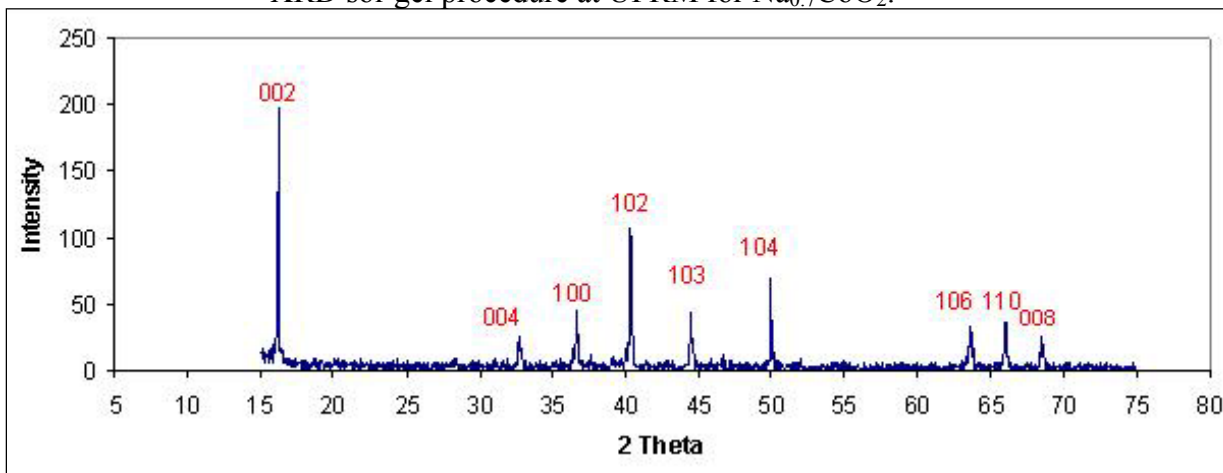


Figure 2: X-ray diffraction spectra of: a) $\text{Na}_{0.65}\text{CoO}_2$ powder prepared by solid state reaction reported in the literature, and b) sol-gel produced $\text{Na}_{0.7}\text{CoO}_2$ at UPRM.

Scanning electron microscopy studies showed that $\text{Na}_{0.7}\text{CoO}_2$ does have a hexagonal morphology (Figure 3). One undergraduate PREM student, Ely X. Colón, trained by Dr. S. P. Singh (PREM post-doctoral researcher) conducted subsequent extensive studies on this new material at the Applied Superconductivity Center of the University of Wisconsin-Madison.

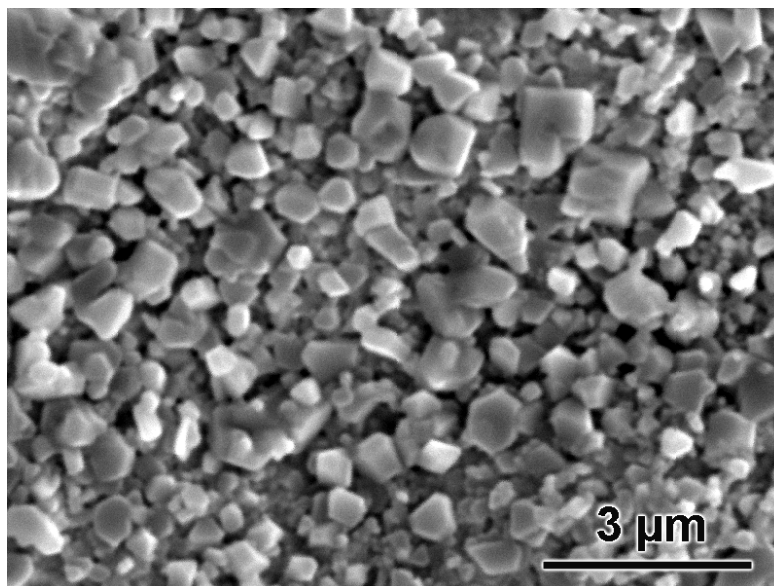


Figure 3: Scanning electron image of sol-gel produced $\text{Na}_{0.7}\text{CoO}_2$ in thin film form.

Title: PREM Award Highlighted in Puerto Rican Media

During a press conference held at the University of Puerto Rico – Mayagüez campus on Monday April 26 Dr. Jorge Iván Vélez Arocho, Chancellor of the University, announced the recent NSF PREM award received by a group of professors in partnership with the University of Wisconsin-Madison. Also those attending the conference there were Dr. Ramón Vasquez Espinoza, Dean of Engineering; Prof. Wilma Santiago, Dean of Administration; and Ms. Margarita Santori, Head of the University Press Office. Subsequently, reporters' from local TV stations and major Puerto Rican newspapers were able to ask specific questions about the grant to the principal investigator, Prof. O. Marcelo Suárez, and the CoPI's, Prof. Jeannette Santos, Prof. Oscar Perales, Prof. Oswald Uwakweh, and Prof. Carlos Rinaldi. The relevance of the partnership with the University of Wisconsin under the leadership of the CoPI, Prof. Eric Hellstrom was highlighted. Additional comments underscored the importance of this \$2.7 million grant not only to the institution and its expanding Materials Science & Engineering community but also to the students and the Puerto Rican people. During these interviews, NSF's concern about achieving a much larger involvement of Hispanic students in the field of Materials Science was also underscored. Additionally, Chancellor Vélez Arocho and Professor Suárez were interviewed by a reporter from the University of Puerto Rico's Public Radio.

That night the local channels, WORA Channel 5 and WOLE Channel 12 aired pieces of the press conference highlighting the university achievements in nanomaterials. On Wednesday April 28 two Puerto Rican newspapers, *El Nuevo Día* (the largest in the island) and *El Vocero*, also included articles related to the award. This week the university press office drew attention to the project through the University of Puerto Rico-Mayagüez main Web page: <http://www.uprm.edu/news/articles/as0482004.html> (*in Spanish*).



From left to right: Prof. O. Marcelo Suárez (PI), Prof. Jeannette Santos (CoPI, leader of the Education & Outreach Office of the project), Prof. Oswald Uwakweh (CoPI, leader of the MgB_2 superconductor processing thrust area), and Prof. Oscar Perales, (CoPI, leader of the spintronics thrust area). Not included in the picture are: Prof. Eric Hellstrom (CoPI, leader of the Univ. of Wisconsin-Madison partnering group), Prof. Carlos Rinaldi (nanomagnetic materials) and Prof. Maharaj Tomar (spintronics). The remaining collaborating professors from the Univ. of Wisconsin-Madison are: C.-B. Eom (spintronics), W. Crone (education and outreach), P. Voyles (characterization of nanostructures), D. Stone (nanocomposites) and D. Larbalestier (superconductors processing).